#13 Dah 4-8-03

IN THE UNITED STATES PATENT AND TRADEMARK OFFICE
BEFORE THE BOARD OF PATENT APPEALS AND INTERFERENCES

Appellants: Cwiakala et al.	:	Group Art Unit: 2182
Serial No.: 09/407,544	:	Examiner: Ilwoo Park
Filed: September 28, 1999	:	Appeal No.:

For: METHOD, SYSTEM AND PROGRAM PRODUCTS FOR MANAGING I/O CONFIGURATIONS OF A COMPUTING ENVIRONMENT

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Date of Signature: March 27, 2003

Board of Patent Appeals and Interferences
Assistant Commissioner for Patents
Washington, D.C. 20231

Brief of Appellants

Dear Sir:

This is an appeal from a final rejection, dated September 25, 2002, rejecting claims 1-47, all the claims being considered in the above-identified application. This Brief is accompanied by a transmittal letter authorizing the charging of appellants' deposit account for payment of the requisite fee set forth in 37 C.F.R. §1.17(c).

Real Party In Interest

This application is assigned to **International Business Machines Corporation** by virtue of an assignment executed by the co-inventors on November 11, 1999, November 12, 1999, November 18, 1999 and November 19, 1999 and recorded with the United States Patent and Trademark Office at reel 010426, frame 0903, on November 26, 1999. Therefore, the real party in interest is **International Business Machines Corporation.**

Related Appeals and Interferences

To the knowledge of the appellants, appellants' undersigned legal representative, and the assignee, there are no other appeals or interferences which will directly affect or be directly affected by or have a bearing on the Board's decision in the instant appeal.

Status of Claims

This patent application was filed on September 28, 1999 with the United States Patent and Trademark Office. As filed, the application included forty (40) claims, of which four (4) were independent claims (i.e., claims 1, 14, 27 & 28).

In an initial Office Action dated March 7, 2002, claims 1-40 were rejected under 35 U.S.C. 102(b) as being anticipated by Maeurer et al. (U.S. Patent No. 5,301,323; hereinafter, "Maeurer"). In appellants' response dated June 28, 2002, filed with a one-month extension of time, claims 1, 6, 14, 19, 27, 28 & 33 were amended, and new claims 41-47 were added, of which one (1) was independent (i.e., claim 43).

In a second and final Office Action dated September 25, 2002, claims 1-42, 44, 46 & 47 were rejected under 35 U.S.C. 103(a) as being unpatentable over Maeurer in view of D'Errico (U.S. Patent No. 6,434,637); and claims 43 & 45 were rejected under 35 U.S.C. 102(b) as being anticipated by Maeurer. In appellants' response dated December 17, 2002, no claim amendments were made.

Appellants received an Advisory Action dated January 14, 2003, which indicated that appellants' Response to the final Office Action did not place the application in condition for allowance.

A Notice of Appeal to the Board of Patent Appeals and Interferences was filed on January 27, 2003. The status of the claims is therefore as follows:

Claims allowed – none;
Claims objected to – none;
Claims rejected – 1-47; and
Claims canceled – none.

Appellants are appealing the rejection of claims 1-47.

Status of Amendments

Appellants' remarks proffered in the Response to the final Office Action dated September 25, 2002 were entered upon filing of the Notice of Appeal and this Appeal Brief. However, no claim amendment was effectuated by the Response. The claims as set out in Appendix A include all prior entered amendments.

Summary of the Invention

In one aspect of appellants' invention, the I/O configuration 1600 (FIG. 16A; see also 214, FIG. 2) of a computing environment 100 (FIG. 1) is dynamically changed 1306 (FIG. 13B) (e.g., one or more channel paths 214 (FIG. 2) are added and/or deleted) in order to move available channel resources 210 (FIG. 2) to where they are needed or to remove excess channel resources 210, without human intervention. To achieve this, as one example, a channel path 214 to be used in the dynamic adjusting is selected 1310, 1312 (FIG. 13A), 1306 (FIG. 13B). The

selection can take into consideration various characteristics, such as I/O velocity 1102 (FIG. 11), 1416 (FIG. 14) and/or others (see, e.g., specification, page 48, lines 3-20).

In one particular aspect, appellants claim a method (e.g., claim 1), system (e.g., claims 14 & 27) , and a program storage device (e.g., claim 28) for managing input/output (I/O) configurations 1600 of a computing environment 100. These claims recite, for instance, selecting a channel path 214 from a plurality of channel paths (FIG. 2, generally) to be used in adjusting an I/O configuration of the computing environment, the selecting being based, at least in part, on an I/O velocity 1102 resulting from selecting the channel path; and dynamically adjusting the I/O configuration using the selected channel path 214. For example, a channel path may be dynamically added to the I/O configuration or dynamically deleted from the I/O configuration (see steps 1310, 1312, FIG. 13A; 1306, FIG. 13B). This channel path used to adjust the I/O configuration is selected based, at least in part, on I/O velocity (see specification, page 48, lines 14-15; see also steps 1314, FIG. 13A and 1416, FIG. 14).

In a further characterization of appellants' invention recited in dependent claims 41 and 46, the plurality of channel paths include one or more channel paths that can be added and one or more channel paths that can be deleted. The selecting of the channel path includes choosing the channel path from the plurality of channel paths which satisfies a best option 1320 (FIG. 13A), the best option taking into consideration the I/O velocity resulting from selecting the channel path (specification, page 48, lines 13-15). The selecting concurrently takes into consideration the one or more channel paths that can be added and the one or more channel paths that can be deleted (see, e.g., specification, page 56, lines 3-11).

In an alternate aspect, appellants claim (e.g., claim 43) a method of managing I/O configurations of a computing environment 100 that includes selecting a channel path 214 from a plurality of channel paths to be used in adjusting an I/O configuration of the computing environment, the selecting being based on a plurality of characteristics (specification, page 48, lines 12-20); and dynamically adjusting the I/O configuration using the selected channel path (see FIGs. 13A & 13B, generally).

In dependent claims 42 and 47, appellants' invention further recites that the dynamically adjusting of the I/O configuration includes moving the selected channel path from one port to another port (1304, FIG. 13A; specification, page 52, lines 22-27).

Issues

1. Whether claims 1-42, 44, 46 & 47 were rendered obvious under 35 U.S.C. 103(a) by Maeurer in view of D'Errico.

2. Whether claims 43 & 45 were anticipated under 35 U.S.C. 102(b) by Maeurer.

Grouping of Claims

Since each ground of rejection provides a group of claims, the following groups of claims are included herein:

I. Claims 1-42, 44, 46 & 47; and
II. Claims 43 & 45.

As understood, the claims of one group of claims do not stand or fall with any other group of claims. Rather, each group of claims is decided independently of the other groups of claims.

Additionally, appellants respectfully submit that claims of Group I do not stand or fall together. For example, claims 41, 42, 46 & 47 each include additional features that provide a separate basis of patentability.

Argument

Group I: Claims 1-42, 44, 46 & 47

As noted, claims 1-42, 44, 46 & 47 stand rejected under 35 U.S.C. 103(a) as being obvious over Maeurer in view of D'Errico. Reversal of this rejection is respectfully requested.

Appellants' invention is directed to managing input/output (I/O) configurations of a computing environment by, in part, dynamically adjusting the I/O configuration of the computing environment using a selected channel path. The channel path is selected at least in part on an I/O velocity resulting from selecting the channel path. This technique stands in sharp contrast to the teachings of Maeurer and D'Errico, either alone or in combination.

Initially, appellants recognize that Maeurer does address dynamic channel path management. However, Maeurer does not take into consideration I/O velocity when making any adjustment, but instead, makes adjustments based on channel path utilization. This is explicitly stated in Maeurer. For example, at Col. 8, lines 32-35, Maeurer recites locating the CHPID with minimum utilization. Further, in Col. 9, lines 33-35, it states, "The CHPID with the most available utilization is always selected." Thus, Maeurer teaches the use of channel path utilization in selecting the channel path used to adjust an I/O configuration, and does not teach or suggest the use of I/O velocity in making the dynamic adjustment, as claimed by appellants.

D'Errico does not overcome the deficiencies of Maeurer as applied against the present invention. D'Errico is directed to balancing workload among current paths in a multipath computer system based on the state of previous I/O operations. That is, D'Errico uses the set of paths that it has and distributes work on those paths. D'Errico is not directed to adjusting or changing an I/O configuration. For example, D'Errico does not change the configuration by adding or deleting paths, but instead, the configuration in D'Errico stays the same and I/O operations are distributed on the current set of paths. D'Errico selects a path of a current set of paths to distribute an I/O operation thereon (see e.g., Abstract; Col. 14, lines 42-45). Thus,

D'Errico is simply distributing I/O operations, and not adjusting an I/O configuration, as claimed by appellants.

The final Office Action cited Col. 14, lines 47-62 of D'Errico as disclosing selection of a channel path based at least in part on I/O velocity resulting from selecting the channel path. In this section, D'Errico mentions that information collected by the host computer to determine which path of a plurality of current paths is to be used for the next I/O operation includes the average response times for particular types of I/O operations, for particular paths, and for particular target logical volumes (Col. 14, lines 62-65). Appellants submit that D'Errico's utilization of average response times is quite different from the use of I/O velocity in the present invention. Average response times in D'Errico are used to select a path from a current set of paths for transmission of an I/O operation (Col. 14, lines 42-45), and not to adjust the I/O configuration. The I/O configuration in D'Errico stays the same; a path of that configuration is selected. Thus, D'Errico fails to teach or suggest one or more aspects of appellants' claimed invention in which I/O velocity is used, at least in part, to select a channel path to be used in adjusting an I/O configuration.

In summary, both Maeurer and D'Errico fail to teach or suggest using I/O velocity, at least in part, in selecting a path to adjust the I/O configuration, as claimed by the present invention. Thus, appellants respectfully submit that independent claim 1, as well as independent claims 14, 27 and 28 are patentable over Maeurer and D'Errico, either alone or in combination.

Moreover, appellants respectfully submit that the dependent claims in Group I are patentable for the same reasons as the aforementioned independent claims, as well as for their own additional characterizations. Thus, appellants respectfully request reversal of the obviousness rejection of these dependent claims, as well.

For example, claims 41 & 46 are believed to have a separate basis of patentability. These claims recite, in part, that the channel path used in the adjusting can be selected from a plurality of channel paths that includes both channel paths that can be added, as well as channel paths that can be deleted, and that the selecting concurrently takes into consideration the one or more paths

that can be added and the one or more paths that can be deleted. Such a process is simply not taught, suggested or implied by Maeurer or D'Errico, either alone or in combination.

In Maeurer, the technique first tries to find a channel path to be added, and then only if no channel path add is possible, does it attempt to find a path to be deleted (Col. 8, lines 30-65). It does not concurrently consider both the add and delete possibilities. Maeurer's consideration of delete options only when channel path additions are not possible can prevent or delay the consideration of potentially beneficial path deletions. For example, two control units that share channels have certain performance targets. In this example, the first control unit is failing to reach its target and the second is exceeding its target. If a shared channel path is added without considering a channel path delete, the second control unit's performance is aided unnecessarily and the first control unit may continue to underperform (if it requires more bandwidth than is available on its portion of the added shared path). However, if one of the existing shared channel paths is deleted from the second unit so that all of its bandwidth is available to the first unit, both units may perform at their respective target levels. This deletion would not be considered in Maeurer until after all possible channel path additions occurred. Advantageously, the present invention considers the add and delete options concurrently and would (in this example) delete the channel path first, and thus find a solution more quickly than the non-concurrent technique in Maeurer. Moreover, allowing a channel path delete to occur as an alternative to possible channel path additions reduces the complexity of the I/O topology (i.e., avoids increasing the number of paths and the resulting increased intertwining of channels and control units), thereby providing faster and more accurate projections of subsequent I/O configuration adjustments.

Further, D'Errico does not overcome the deficiencies of Maeurer as applied to appellants' claimed invention. D'Errico does not describe the adjusting of an I/O configuration, and specifically does not describe adding or deleting a channel path. It simply describes using the current set of paths to transmit I/O operations thereon. In support of the rejection, the Office Action refers to Col. 4, lines 5-19 and Col. 9, line 45 – Col. 10, line 29 of D'Errico. However, a careful reading of these sections indicates that a path of a current set of paths is being used for transmission, and there is no teaching or suggestion of changing the I/O configuration by adding or deleting paths. Thus, D'Errico does not overcome the deficiencies of Maeurer. Based on the

foregoing, appellants respectfully submit that dependent claims 41 & 46 are patentable over Maeurer and D'Errico, either alone or in combination.

Moreover, appellants respectfully submit that claims 42 and 47 include a separate basis of patentability. For example, these claims explicitly indicate that the dynamically adjusting of the I/O configuration includes moving the selected channel path from one port to another port. This process is not taught or suggested by Maeurer and D'Errico, either alone or in combination.

Maeurer describes ports as being connected to different paths (Col. 5, lines 6-7), but does not teach or suggest moving a selected channel path from one port to another to dynamically adjust the I/O configuration. Further, D'Errico does not address this deficiency of Maeurer. The final Office Action stated that Col. 9, lines 39-49 of D'Errico teaches moving the selected channel path from one port to another port. This section of D'Errico describes movement of a lock from one path to another. The lock in D'Errico selects a particular path on which an I/O operation can be completed without being interrupted by another I/O operation targeting the same disk drive (Col. 9, lines 30-33). Applicants respectfully submit that lock movement in D'Errico and the channel path movement from port to port in appellants' claimed invention are very different.

In D'Errico, lock movement is part of a channel path selection process in which a lock is moved from one channel path to allow the execution of a subsequent I/O operation on a different channel path. In contrast, the present invention's port to port movement of a channel path is not directed to selecting a different path. Rather, its purpose is to move an existing path to dynamically adjust an I/O configuration. For example, when a channel path in the present invention wants to use one control unit port that is busy while other ports on the control unit are not busy, the busy port can be avoided by moving the path to another port on the same control unit, thereby adjusting the I/O configuration (see specification, page 52, lines 14-26). Moreover, the movement of the path to avoid a busy port in the present invention is an alternative to a channel path addition, and thus advantageously avoids increasing the complexity of the I/O topology. The discussion of lock movement in D'Errico is not directed to avoiding a busy port. Instead, the lock movement incurs a time penalty that leads to an advantage in restricting the

selection of channel paths on which parallel I/O operations target a particular device, and queuing subsequent I/O operations only on those paths, even if those paths (and their associated ports) are busy (see Col. 9, lines 45-52).

Since both Maeurer and D'Errico fail to describe, teach or suggest, appellants' claimed feature of moving the selected channel path from one port to another port to dynamically adjust an I/O configuration, appellants respectfully request reversal of the obviousness rejection of claims 42 & 47.

For all of the reasons stated above, appellants respectfully request an indication of allowability for the claims of Group I.

Group II: Claims 43 & 45

Claims 43 & 45 stand rejected under 35 U.S.C. 102(b) as being anticipated by Maeurer. Reversal of this rejection is respectfully requested.

Appellants claim a method of managing input/output configurations of a computing environment (e.g., claim 43) that includes, for instance, selecting a channel path from a plurality of channel paths to be used in adjusting an I/O configuration of the computing environment, the selecting being based on a plurality of characteristics; and dynamically adjusting the I/O configuration using the selected channel path. Thus, in this aspect of appellants' claimed invention, the channel path is selected based on a plurality of characteristics. This process is different from that described by Maeurer.

In Maeurer, selection of the channel path is based solely on channel utilization, i.e., one characteristic. In contrast, appellants recite that a plurality of characteristics are used in making the selection of a channel path to be used in dynamically adjusting the I/O configuration. Thus, Maeurer does not anticipate, teach or suggest appellants' claimed invention.

In the final Office Action, it is stated that the feature upon which appellants rely (i.e., I/O velocity) is not recited in the rejected claims. Moreover, the Advisory Action stated that an additional feature (i.e., complexity of the resulting I/O configuration) is also relied upon by appellants and not recited in the present invention. In the previous Responses, appellants described the aspect of the invention recited by claim 43 and included the sentence, "In just one example, the plurality of characteristics may include I/O velocity and complexity of the resulting I/O configuration." This sentence was included for exemplary purposes only, and appellants are not, relying on these specific features in their remarks relative to claim 43. Instead, appellants rely on the feature that a plurality of characteristics are employed in selecting a channel path to be used in adjusting an I/O configuration.

Appellants respectfully submit that dependent claim 45 is patentable for the same reasons as independent claim 43 from which it depends, as well as for its own additional characterizations.

Based on the foregoing, appellants respectfully submit that the claims of Group II are not taught, or even suggested, by Maeurer. Thus, an indication of allowability of these claims is respectfully requested.

Conclusion

Appellants respectfully request reversal of the rejections set forth in the final Office Action. Appellants respectfully submit that their claimed invention would not have been obvious to one of ordinary skill in the art based upon Maeurer and D'Errico, either alone or in combination, nor is it anticipated by Maeurer.

As one example, appellants submit that neither of the applied references, either alone or in combination, teaches or suggests selecting a channel path based at least in part on an I/O velocity resulting from selecting the channel path. As another example, neither applied reference, alone or in combination, describes or suggests the selecting of the channel path concurrently taking into consideration the paths that can be added and the paths that can be

deleted. As still another example, the applied references do not disclose or suggest dynamically adjusting the I/O configuration by moving the selected channel path from one port to another. Further, relative to the anticipation rejection, appellants submit that Maeurer does not teach selecting the channel path based on multiple characteristics.

For all of the above reasons, appellants allege error in rejecting their claims as obvious, or anticipated, based on the applied art. Accordingly, reversal of all rejections is respectfully requested.

Respectfully submitted,

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Dated: March 27, 2003

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Appendix A

1. A method of managing input/output (I/O) configurations of a computing environment, said method comprising:

selecting a channel path from a plurality of channel paths to be used in adjusting an I/O configuration of said computing environment, said selecting being based at least in part on an I/O velocity resulting from selecting the channel path; and

dynamically adjusting said I/O configuration using the selected channel path.

2. The method of claim 1, wherein said dynamically adjusting comprises attaching the selected channel path to a subsystem of said I/O configuration.

3. The method of claim 2, wherein said selected channel path and said subsystem are associated with a workload executing within at least one logical partition of said computing environment, and wherein the dynamically adjusting provides additional resources to said workload.

4. The method of claim 3, wherein said selected channel path was removed from another workload executing within at least one logical partition, thereby reducing resources of said another workload.

5. The method of claim 1, wherein said dynamically adjusting comprises removing attachment of the selected channel path from a subsystem of said I/O configuration.

6. The method of claim 1, wherein said selecting is further based on at least one of an impact on response time to achieve specific workload goals, contention on a subsystem of

said I/O configuration, availability characteristics of said channel path, and complexity of the resulting I/O configuration.

7. The method of claim 1, further comprising determining that said I/O configuration is to be adjusted.

8. The method of claim 7, wherein said determining comprises using one or more workload goals in making the determination.

9. The method of claim 8, wherein the one or more workload goals are associated with workloads of a group of partitions of said computing environment.

10. The method of claim 7, wherein said determining comprises consulting with one or more workload managers of said computing environment in making the determination.

11. The method of claim 7, wherein said determining comprises using measured subsystem performance being within an average target range in making the determination.

12. The method of claim 1, further comprising projecting an impact of the adjustment on one or more subsystems to be effected by the adjustment, prior to said dynamically adjusting.

13. The method of claim 12, further comprising dynamically adjusting when the impact is acceptable.

14. A system of managing input/output (I/O) configurations of a computing environment, said system comprising:

means for selecting a channel path from a plurality of channel paths to be used in adjusting an I/O configuration of said computing environment, the selecting being based at least in part on an I/O velocity resulting from selecting the channel path; and

means for dynamically adjusting said I/O configuration using the selected channel path.

15. The system of claim 14, wherein said means for dynamically adjusting comprises means for attaching the selected channel path to a subsystem of said I/O configuration.

16. The system of claim 15, wherein said selected channel path and said subsystem are associated with a workload executing within at least one logical partition of said computing environment, and wherein the dynamically adjusting provides additional resources to said workload.

17. The system of claim 15, wherein said selected channel path was removed from another workload executing within at least one logical partition, thereby reducing resources of said another workload.

18. The system of claim 14, wherein said means for dynamically adjusting comprises means for removing attachment of the selected channel path from a subsystem of said I/O configuration.

19. The system of claim 14, wherein said selecting is further based on at least one of an impact on response time to achieve specific workload goals, contention on a subsystem of said I/O configuration, availability characteristics of said channel path, and complexity of the resulting I/O configuration.

20. The system of claim 14, further comprising means for determining that said I/O configuration is to be adjusted.

21. The system of claim 20, wherein said means for determining comprises means for using one or more workload goals in making the determination.

22. The system of claim 21, wherein the one or more workload goals are associated with workloads of a group of partitions of said computing environment.

23. The system of claim 20, wherein said means for determining comprises means for consulting with one or more workload managers of said computing environment in making the determination.

24. The system of claim 20, wherein said means for determining comprises means for using measured subsystem performance being within an average target range in making the determination.

25. The system of claim 14, further comprising means for projecting an impact of the adjustment on one or more subsystems to be effected by the adjustment, prior to the dynamically adjusting.

26. The system of claim 25, further comprising dynamically adjusting when the impact is acceptable.

27. A system of managing input/output (I/O) configurations of a computing environment, said system comprising:

a processor adapted to select a channel path from a plurality of channel paths to be used in adjusting an I/O configuration of said computing environment, the selecting being based at least in part on an I/O velocity resulting from selecting the channel path; and

a processor adapted to dynamically adjust said I/O configuration using the selected channel path.

28. At least one program storage device readable by a machine, tangibly embodying at least one program of instructions executable by the machine to perform a method of managing input/output (I/O) configurations of a computing environment, said method comprising:

selecting a channel path from a plurality of channel paths to be used in adjusting an I/O configuration of said computing environment, said selecting being based at least in part on an I/O velocity resulting from selecting the channel path; and

dynamically adjusting said I/O configuration using the selected channel path.

29. The at least one program storage device of claim 28, wherein said dynamically adjusting comprises attaching the selected channel path to a subsystem of said I/O configuration.

30. The at least one program storage device of claim 29, wherein said selected channel path and said subsystem are associated with a workload executing within at least one logical partition of said computing environment, and wherein the dynamically adjusting provides additional resources to said workload.

31. The at least one program storage device of claim 30, wherein said selected channel path was removed from another workload executing within at least one logical partition, thereby reducing resources of said another workload.

32. The at least one program storage device of claim 28, wherein said dynamically adjusting comprises removing attachment of the selected channel path from a subsystem of said I/O configuration.

33. The at least one program storage device of claim 28, wherein said selecting is further based on at least one of an impact on response time to achieve specific workload goals,

contention on a subsystem of said I/O configuration, availability characteristics of said channel path, and complexity of the resulting I/O configuration.

34. The at least one program storage device of claim 28, wherein said method further comprises determining that said I/O configuration is to be adjusted.

35. The at least one program storage device of claim 34, wherein said determining comprises using one or more workload goals in making the determination.

36. The at least one program storage device of claim 35, wherein the one or more workload goals are associated with workloads of a group of partitions of said computing environment.

37. The at least one program storage device of claim 34, wherein said determining comprises consulting with one or more workload managers of said computing environment in making the determination.

38. The at least one program storage device of claim 34, wherein said determining comprises using measured subsystem performance being within an averaged target range in making the determination.

39. The at least one program storage device of claim 34, wherein said method further comprises projecting an impact of the adjustment on one or more subsystems to be effected by the adjustment, prior to said dynamically adjusting.

40. The at least one program storage device of claim 39, wherein said method further comprises dynamically adjusting when the impact is acceptable.

41. The method of claim 1, wherein said plurality of channel paths include one or more channel paths that can be added and one or more channel paths that can be deleted, and wherein the selecting comprises choosing the channel path from the plurality of channel paths

which satisfies a best option, the best option taking into consideration the I/O velocity resulting from selecting the channel path, and wherein the selecting concurrently takes into consideration the one or more channel paths that can be added and the one or more channel paths that can be deleted.

42. The method of claim 1, wherein said dynamically adjusting comprises moving the selected channel path from one port to another port.

43. A method of managing input/output (I/O) configurations of a computing environment, said method comprising:

selecting a channel path from a plurality of channel paths to be used in adjusting an I/O configuration of said computing environment, said selecting being based on a plurality of characteristics; and

dynamically adjusting said I/O configuration using the selected channel path.

44. The method of claim 43, wherein said plurality of characteristics comprise an I/O velocity resulting from selecting the channel path.

45. The method of claim 43, wherein said plurality of characteristics include at least one of an impact on response time, an impact on response time to achieve specific workload goals, contention on a subsystem of said I/O configuration, availability characteristics of said channel path, and complexity of the resulting I/O configuration.

46. The method of claim 43, wherein said plurality of channel paths include one or more channel paths that can be added and one or more channel paths that can be deleted, and wherein the selecting comprises choosing the channel path from the plurality of channel paths which satisfies a best option, the selecting concurrently taking into consideration the one or more channel paths to be added and the one or more channel paths to be deleted.

47. The method of claim 43, wherein said dynamically adjusting comprises moving the selected channel path from one port to another port.